QUALITY ASSURANCE PROJECT PLAN FOR ENVIRONMENTAL SAMPLING AND ANALYSIS PLAN FOR NAVAL STATION, TREASURE ISLAND, HUNTERS POINT ANNEX SAN FRANCISCO, CALIFORNIA

Prepared for:

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QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR ENVIRONMENTAL SAMPLING AND ANALYSIS PLAN REVISION 1

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1.0 INTRODUCTION

This quality assurance project plan (QAPjP) identifies the quality assurance/quality control (QA/QC) protocols, organization, objectives, functional activities, and policy for sample collection, sample analysis, and data evaluation for the Environmental Sampling and Analysis Plan (ESAP) for Naval Station, Treasure Island, Hunters Point Annex (HPA), San Francisco, California.

2.0 PROJECT DESCRIPTION

The objective of the ESAP is to provide sufficient data to address specific environmental concerns at HPA. Environmental concerns focus on the potential environmental effects associated with the release of contaminants from HPA. The environmental effects to be addressed include toxicity to organisms in contact with either sediments or storm water runoff, and bioaccumulation by aquatic organisms.

The ESAP addresses environmental concerns at HPA and will supplement previous environmental sampling programs. Implementation of the ESAP will provide data to address the environmental effects of potential contamination at HPA by completion of the three specific task objectives: evaluation of the toxicity of sediments to appropriate test organisms; evaluation of whether persistent and bioaccumulative substances may be entering the San Francisco Bay using transplanted mussels as a biological indicator; and evaluation of the toxicity of storm water runoff to sensitive test organisms. These tasks are described in detail in the ESAP.

3.0 SITE BACKGROUND/PREVIOUS INVESTIGATIONS

3.1 Site Characterization

There have been numerous studies performed to (1) identify sites where usage, storage, or disposal of hazardous materials may have impacted the environment; and (2) characterize existing conditions at the identified sites onshore. These investigations have been performed under the Navy Installation Restoration (IR) program. Concurrent with the IR studies, the San Francisco District Attorney's (DA) office investigated 20 sites potentially contaminated by Triple A activities at HPA (DA, 1987); these site locations are referred to as Triple A sites.

Under the IR program, there were originally 11 IR (IR-1 through IR-11) sites planned for Remedial Investigations and Feasibility Studies (RI/FS). Ten of the Triple A sites are encompassed by five of the IR sites; the remaining Triple A sites are separate. These are sites where there is known contamination. The remaining 10 Triple A sites were originally grouped into sites PA-12 through PA-18 on the basis of a preliminary assessment conducted for the Triple A sites (HLA, 1989).

As a result of the preliminary assessment and recommendations from EPA (HLA, 1989), five of the PA sites are being incorporated into the IR program in a newly formulated Operable Unit V. The prefix for the site numbers has been changed from "PA" to "IR" to reflect this inclusion. Volume 2F to the RI/FS work plan for HPA has been prepared to address the RIs at these sites (HLA, 1990a). Site inspections are planned at sites PA-16 and PA-18 (HLA 1990b). Recommendations for inclusion of the sites in the IR program will be based on the results of the site inspections.

In addition to the RI/FS and the site inspection activities being conducted at the IR and PA sites, the Navy has conducted a preliminary assessment of the remaining HPA facility to identify areas where contamination may exist (HLA, 1990c). The areas being investigated include the storm sewer system and other underground utilities, railroad tracks, electrical transformer locations, and areas outside of existing IR and PA site boundaries.

Underground storage tank HPA have been previously identified and investigated. Information regarding the location and status of the USTs is presented in the UST "Removal Action Plan/Closure Plan," (PRC, 1990).

3.2 Environmental Sampling Activities

The above activities are being conducted to characterize sites where contamination may exist. The environmental sampling activities are planned to address the environmental impacts of contamination originating from sites throughout the HPA facility.

Storm water sampling was conducted by HLA in December of 1990 to characterize selected storm water runoff sources at HPA (HLA, 1988). This study provided chemical characterization of storm water runoff quality at four locations selected to be representative of storm water runoff from various potential sources of contaminants near IR sites. Storm water samples were collected from each of the four stations and the samples subsequently analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SOCs) pesticides and polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPHs), metals, oil and grease and ph. The results of this study are not yet available. Additional storm water sampling is planned to characterize the chemical constituents of the storm water within the storm sewer system.

An Environmental Impact Statement (EIS) was prepared by Environmental Science Associates (ESA, 1987) to assess the potential effects of homeporting two ships of a Battleship Battlegroup, the U.S.S. Missouri and an escort cruiser, and a nine-ship Cruiser Destroyer Group in San Francisco Bay. As a result of this study, the preferred homeporting location at HPA resulted in extensive environmental analyses including verification testing of dredge sediments to verify and expand upon existing chemical and toxicity information. The primary focus of this study addressed the potential environmental effects of dredge sediments from areas of proposed use. Study results indicated that metal concentrations measured during verification testing were substantially below Total Threshold Limit Concentrations (TTLC). The organic compounds which were detected, primarily PAHs, were at low concentrations well below levels reported to have the potential for significant effects on marine organisms. The only pesticides detected were 4,4-DDD and 4,4-DDE, however reported concentrations were low. Acetone was the only volatile organic chemical found and was present in only trace amounts. The suspended particulate phase bioassays conducted during the verification testing indicated that the Limiting Permissible Concentration (LPC) would not be exceeded during disposal of sediments from HPA. With the exception of the amphipod bioassay test, none of the solid-phase bioassays conducted on Homeporting alternative site (including HPA) sediments exhibited significant mortalities. The mean amphipod survival in bioassay tests performed on HPA sediments was 45%, significantly lower compared to survival in offshore reference sediments.

EMCON (1987) also performed chemical and bioassay studies on dredge sediments in support of a maintenance dredging permit application for Dry Dock #4 at HPA. In this investigation,

sediment and elutriate chemical analyses for VOCs, SOCs, pesticides and PCBs, metals and tributyltin indicated levels of contaminants tested for were below regulatory target levels. The fish and mysid elutriate and solid-phase bioassays performed did not indicate that the LPC of the Suspended Particulate Phase and the Solid-Phase would be exceeded during ocean disposal of dredge materials from Dry Dock #4, HPA.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The following is a description of project team organization and responsibilities of key personnel involved with the environmental sampling and analysis for HPA. A project organization flow chart is presented in Appendix A.

4.1 ORGANIZATION

Program Manager:	Ronald M. Block, Ph.D.
Project Manager:	Leslie Rueth
Field Operations Manager:	Julianne Fegley
Quality Assurance Officer:	William E. Motzer, Ph.D.
Health and Safety Coordinator:	William E. Motzer, Ph.D.
Laboratory Coordinator:	Leslie Rueth

4.2 RESPONSIBILITIES

4.2.1 Program Manager

The responsibilities of the program manager include:

- Providing guidance and direction to the project manager, as appropriate
- Providing sufficient resources to the project team so it can fully expedite the requirements of the ESAP
- Reviewing and signing final ESAP report

4.2.2 Project Manager

The project manager is responsible for overall project scheduling, technical, and financial matters, including:

- Developing conclusions and recommendations based on data gathered
- Reviewing and approving the QAPjP and the ESAP
- Discussing deviations in procedures as outlined in the ESAP with the quality assurance officer

- o Providing technical oversight
- o Coordinating project personnel, subcontractors, equipment, and services
- o Reviewing subcontractor budgets and reports
- o Monitoring the project schedule and budget

4.2.3 Field Operations Manager

The field operations manager is responsible for all field activity, including:

- o Providing direction and supervision of field sampling team members
- o Coordinating field personnel and equipment
- o Identifying corrective actions, as warranted
- o Supervising and ensuring proper field documentation procedures
- o Ensuring the calibration of field equipment
- o Maintaining field records

4.2.4 Quality Assurance Officer

Responsibilities of the quality assurance (QA) officer include:

- o Responding to QA/QC questions and concerns
- o Ensuring corrective action involving QA/QC nonconformances
- o Reviewing and approving modifications to the ESAP QA/QC procedures
- o Supervision of QA/QC procedures for data management and report preparation
- o Reviewing QA/QC calculations

4.2.5 Health and Safety Coordinator

Responsibilities of the health and safety coordinator include:

- o Reviewing and approving a site-specific health and safety plan (HSP)
- o Ensuring site personnel have received proper training
- o Ensuring that site personnel adhere to the HSP
- o Approving modifications to the health and safety plan

4.2.6 Laboratory Coordinator

The laboratory coordinator's responsibilities include:

- Coordinating with laboratories on QA/QC matters
- Ensuring that sample storage and transfer procedures comply with QA/QC requirements
- Reviewing laboratory QA/QC reports, and identifying existing or potential problems

5.0 QUALITY ASSURANCE OBJECTIVES

The QA objectives are to design and implement procedures for obtaining and evaluating precise, accurate, and complete field and laboratory data. Sampling procedures, field measurements, and laboratory analyses shall provide analytical data that is comparable and representative of actual field conditions. Definitions of the QA objectives for accuracy, precision, completeness, representativeness, and comparability are as follows (quoted from EPAs "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80):

- Accuracy - the degree of agreement of a measurement with an accepted reference or true value usually expressed as the difference between the two values or the difference as a percentage of the reference or true value and sometimes expressed as a ratio. Accuracy is a measure of the bias in a system.
- Precision - a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation or relative percent difference. Various measures of precision exist depending upon the "prescribed similar conditions."
- Completeness - a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.
- Representativeness - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- Comparability - expresses the confidence with which one data set can be compared to another.

The actual calculation of the quantitative measure of accuracy, precision, and completeness are presented in Section 18.

6.0 SEDIMENT SAMPLING PROCEDURES

Sediment sampling procedures for grab and core sampling are discussed in the following sections. A summary of the sampling and analysis plan including sampling locations, the number and type of samples at each location, the sample matrices, and sample analyses is presented in Table 1. Planned test sampling station locations are shown on Plate 1.

The sediment toxicity segment of the ESAP is designed to evaluate the concentrations and potential toxicity of chemicals in surficial and shallow bay sediments surrounding HPA. The sediment toxicity program consists of the collection of sediment grab samples and sediment core samples from 17 test stations and 2 reference stations. A sediment grab sample will also be collected from a control station in San Pablo Bay.

The proposed test station areas were selected based on the following criteria: 1) their proximity to areas of known or potential contamination, 2) past historical shoreline and berth uses, 3) near areas of potential contamination at HPA and 4) accessibility for sampling

6.1 Sediment Grab Sampling

Grab sediment samples will be collected using a Peterson grab sampler. The samples will be screened for gamma and beta radioactivity upon collection using an Eberline E120 radiation meter with GM pancake probe. Alpha radiation will be screened for with an Eberline ESP 1 portable radiation survey meter with a scintillation probe AC3-7. The samples will be discarded if they are low in volume or contain visible foreign objects.

Samples will be placed in airtight wide-mouth polyethylene (metals and tributyltin) or glass (SOCs, pesticides, and PCBs) jars upon collection and sealed until they are composited. Care will be taken to minimize contamination and alteration of the physical and chemical properties of the sample from freezing, oxidizing in air, or drying.

Grab sediment samples will be composited by removal of approximately one liter of sediment from each sample to be included in a ten sample composite, and transferred to a separate 10 liter container. The sediment to be composited will be taken from the interior of each collection jar.

Samples in the 10 liter container, filled to overflowing, will be slowly stirred with a stainless steel rod to ensure adequate mixing. Samples for physical and chemical analyses will be removed from the composite sample, and the completely filled 10 liter container will be sealed and labeled appropriately for analysis. The 10 liter container will be stored immediately in an ice chest at 2° to 4° C and maintained at that temperature until processed. Samples will be used in the modified solid-phase and suspended particulate phase bioassays, to be initiated within seven to ten days of sample collection.

Samples of the composite, that will be used for analysis of physical parameters (grain size), will be placed in clean, wide-mouth polyethylene or glass containers and labeled appropriately. Samples of the composite that will be used for chemical analyses will be placed in clean, wide-mouth polyethylene or glass jars, sealed, labeled appropriately, and stored immediately in ice chests at 2° to 4° C and maintained at that temperature until analyses.

Sediment samples will be sent to a certified CLP laboratory(s) immediately following collection where they will be split for analyses. Chemical analyses will include CLP inorganics, CLP SOCs, and CLP pesticides and PCBs. Tributyltin will be analyzed by n-pentyl derivitization with gas chromatography/flame photometric detection (GC/FPD).

The radioactivity measurements (alpha and beta particles and gamma rays) will be recorded for the control sediment sample and will be considered the background level. Radioactivity measurements recorded for test and reference sediments will be compared to this background level. Should radiation levels of test sediments be above the background levels, a non-composited sample will be removed, stored appropriately, and submitted for laboratory testing of radioactivity.

Sediment samples will also be used in both solid-phase and liquid suspended particulate phase bioassays for determination of toxicity.

6.2 Sediment Core Sampling

Sediment core samples will be collected using a two-inch gravity-type corer with cellulose acetate butyrate (CAB) core liner tubes deployed from a boat. Continuous core samples will be collected to a depth of 3 feet below the sediment-water interface. Upon retrieval, the CAB core liner tubes will be extracted from the corer, capped with teflon-lined core caps, sealed with tape, labeled and placed on ice in an ice chest maintained at 2° to 4° C. Prior to capping, core samples will be screened for gamma and beta radiation upon collection with an Eberline E120 portable radiation survey meter with a GM pancake probe and for alpha radiation with an Eberline ESP 1 portable radiation survey meter with a scintillation probe. Should radiation levels of the test core sediments be above the background level, a non-composited sample will be removed, store appropriately, and submitted for laboratory testing of radioactivity.

Discrete core samples will be extracted from the cores at the laboratory to avoid potential sample contamination in the field. Core samples will be analyzed for the analytes described in Section 6.1, plus additional analysis for CLP VOCs.

7.0 MUSSEL DEPLOYMENT PROCEDURES

The mussel transplant program segment of the ESAP is designed to evaluate persistent and bioaccumulative substances which may be present in the waters surrounding HPA above background levels. The potential presence of contaminants from HPA in the San Francisco Bay surrounding HPA, and their potential for bioaccumulation into aquatic organisms will be determined by measuring the chemical uptake of these substances into the mussel, Mytilus californianus. Mussels collected from an uncontaminated area will be transplanted in the waters surrounding HPA and collection and subsequent chemical analysis of the mussel tissue will provide an indication of which persistent and bioaccumulative substances are present. Deployment station locations are shown on Plate 2.

The mussel transplant stations were selected based on the following criteria: 1) their proximity to areas of known or potential contamination, 2) areas close to shore to address potential groundwater seepage, direct surface water runoff, and/or discharge from storm sewer outfalls, 4) past historical shoreline uses and berth uses, 5) near areas of potential contamination at HPA and 6) accessibility for transplant and retrieval of mussels.

Collected mussels will be stored in unfrozen ice chests for no longer than 48 hours prior to deployment in the field. Field precautions will be taken to avoid contamination from sources such as boat exhaust. Polyethylene gloves will be worn during deployment of mussels. Mussels in mesh bags will be placed in polyethylene bags from the time they are removed from the ice chests until they are deployed.

Mesh bags containing mussels will be attached with nylon cable ties and deployed in shallow water (less than 90 meters in depth) on a securely anchored buoy system. The buoy system will consist of an earth anchor, a polypropylene line or a cable, and an inflatable subsurface float.

Two 30-day mussel deployment tests will be conducted; one in April or August/September to assess potential bioaccumulative effects during dry weather conditions, and one in January/February to assess wet weather condition potential bioaccumulative effects. The protocol and methodologies employed in the two mussel deployment test periods will otherwise be identical.

Tissue analyses will consist of analysis for metals by EPA Method 6010 and EPA Method 7000 series, SOCs by EPA Method 8270, pesticides and PCBs by EPA Method 8080 and tributyltin by GC/FPD.

All mussel tissue samples will be screened for beta and gamma radiation using an Eberline E120 radiation meter with a GM pancake probe and for alpha radiation with an Eberline ESP 1 radiation survey meter with a scintillation probe AC3-7 upon collection and upon retrieval of the mussels. Radioactivity measurements will be compared to the background level measured for the control mussels. Should the results of this radioactivity screen show counts greater than background, additional samples will be collected and submitted to a radiation-certified analytical laboratory for analysis of radioactivity.

8.0 STORM WATER TOXICITY SAMPLING PROCEDURES

The storm water runoff toxicity evaluation segment of the ESAP is designed to determine the potential toxicity of storm water runoff from HPA. This program consists of the collection of storm water samples from designated sampling points in the storm water sewer system at HPA for use in chronic bioassays for determination of potential toxicity. Storm water sampling points are shown on Plate 3.

Collection of storm water runoff samples will take place as soon as possible within the first significant storm event of the rainy season. A composite sample of storm water will be manually collected in a 10 liter glass or polyethylene container over an 8-hour period (at the rate of 10 liters every hour) at each runoff sampling point to provide an indication of the average quality of the effluent over the sampling period. The composite samples will be chilled to 4° C during collection and stored at this temperature until used for toxicity testing. The samples will be used for toxicity testing within 36 hours of collection.

Storm water runoff sampling points were selected based on the following criteria: 1) proximity to or contribution of discharge from areas of known or potential contamination, 2) known discharge points, 3) representative of "worst-case" storm water runoff from past activities at HPA and 4) accessibility for collection of adequate quantities of storm water for use in the chronic bioassays.

Chemical analyses of storm water runoff will include CLP inorganics, CLP VOCs, CLP SOCs, CLP pesticides and PCBs, and tributyltin by GC/FPD.

Storm water samples will also be utilized in 3-species chronic bioassays for assessment of toxicity.

9.0 SAMPLE SHIPPING PROCEDURES

Generally samples will be transported to analytical or bioassay laboratories either by ATT field personnel or by laboratory couriers. Some samples may be shipped to laboratories by overnight courier. The handling, transportation and transfer of all samples will follow chain-of-custody protocol as outlined in Section 11.0.

10.0 DECONTAMINATION PROCEDURES

Equipment decontamination and sample disposal procedures are discussed in the following sections.

10.1 Equipment Decontamination Procedures

Equipment that may come into contact with potentially contaminated water, sediment, or test organisms will be thoroughly decontaminated prior to and after use. Decontamination procedures consist of washing with an Alconox detergent solution, followed by a double rinse of tap water and a final rinse of distilled water.

10.2 Disposal Procedures

All samples will be retained pending analytical results. Once analytical results have been obtained and validated, samples will be disposed of in accordance with applicable federal, state, and local regulations.

11.0 SAMPLE CUSTODY PROCEDURES

Sample custody procedures will be followed for the duration of sample collection and analysis as outlined in the ESAP. Custody procedures are followed through sample collection, transfer, analysis, and disposal.

11.1 Field Custody Procedures

Sampling locations and sample types and quantities are determined in the ESAP prior to commencement of collection. The Field Operations Manager will designate and supervise field personnel in the collection of samples. Samples will be handled by designated personnel only. Chain-of-custody seals will be used for samples which are shipped.

11.2 Field Documentation

Each sample container will have its own identification label. The following information will be included on each label:

- Project name

- Site name
- Sample identification number
- Date and time of sample collection
- Type of sample matrix
- Name of sampler
- Sample preservation used, as applicable
- Type of analyses to be conducted

All samples transferred to laboratories for analysis are accompanied by a chain of custody form (COC). The COC form records the custody of samples and assures that samples are properly maintained at all times. A COC form is presented in Appendix B. The following information will be included on all COC forms:

- Identification number
- Date of collection
- Sample matrix
- Analyses requested
- Name and signature of collector
- Signature of person releasing samples
- Signature of person receiving samples
- Date and time samples were released and subsequently received
- Name of the person to whom sample results should be sent
- Any remarks related to sample identification, place of collection, COC, field observations, or compositing procedures

The field COC will terminate when the laboratory receives and verifies the samples. Copies of all COC forms will be retained by the Field Operations Manager for field records.

Samples will be stored and transferred in accordance with procedures specified in the ESAP for each sample type.

Field sampling logbooks with bound pages will be maintained by the Field Operations Manager or his designee. Logbooks will provide daily records of significant events, observations, and measurements during field operations. Each entry will be signed and dated by the person making the entry. Field logbooks will provide a permanent record of field activities and will

contain sufficient data to enable participants to reconstruct events that occurred during field activities. All logbook entries will be timely, factual, detailed, and objective.

11.3 Corrections to Documentation

Original documents including COC forms and field logbooks will not be altered, destroyed, or discarded. If original documents are illegible or contain inaccuracies that require replacement documents, the originals will be retained and filed with the corrected document.

If any error is made in recording, a simple line will be drawn through the error. The correct information will then be entered and the change will be initialed and dated. The erroneous information will not be obliterated or obscured in any way. Errors discovered subsequent to document completion will be corrected, initialed, and dated by the person discovering the error.

11.4 Laboratory Custody Procedures

A designated laboratory custodian will accept custody of the samples and will sign and keep copies of the COC form. Identity of the shipped samples will be verified against the COC form. Samples will be examined to confirm that all required information is present on the sample labels. If any breakage or discrepancy arises between the COC form, sample labels, and requested analyses, the laboratory custodian will notify the laboratory coordinator.

After inspection, each sample will be assigned a laboratory identification number. The samples will be transferred to designated analysts or stored appropriately in a secured area prior to analysis. The analysts will be responsible for the samples until they are returned to the sample custodian. Specific laboratory COC procedures are described in the Standard Operating Procedure (SOP) on file at the laboratory (or in the laboratory QAPP).

11.5 Sample Handling and Storage

Samples will be handled and stored in accordance with established protocol for each sample type. Sample handling procedures are summarized in Table 2.

Sediment: Samples will be placed in airtight wide-mouth polyethylene or glass jars upon collection and sealed until they are composited. Care will be taken to minimize contamination and alteration of the physical and chemical properties of the sample from freezing, oxidizing in air, or drying.

Grab sediment samples will be composited by removal of approximately one liter of sediment from each sample to be included in a ten sample composite, and transferred to a separate 10 liter container. Sediments will be stored in an ice chest at 2° to 4° C and maintained at that temperature until processed. Modified solid-phase and liquid suspended particulate phase bioassays will be initiated within seven to ten days of sample collection.

Samples of the composite that will be used for analysis of physical parameters (grain size) will be placed in clean, wide-mouth polyethylene or glass containers and appropriately labeled. Samples of the composite that will be used for chemical analyses will be placed in clean, wide mouth glass jars, sealed, labeled appropriately, and stored immediately in ice chests at 2° to 4° C and maintained at that temperature until analyzed. Sediment grab samples will be analyzed for inorganics, SOCs, pesticides and PCBs, and tributyltin.

Upon retrieval, the CAB core liner tubes will be extracted from the corer, capped with teflon lined core caps, sealed with tape, labeled and placed on ice in an ice chest maintained at 2° to 4° C. Discrete core samples will be extracted from the cores at the laboratory to avoid potential sample contamination in the field. Core samples will be analyzed for inorganics, VOCs, SOCs, pesticides and PCBs, and tributyltin.

Mussel Tissue: Once brought to shore, the samples to be used for metals analysis will be placed in pre-cleaned polyethylene bags (4 mm thick). The bag will then be placed inside two additional polyethylene bags. Samples to be analyzed for organics will be placed in pre-cleaned aluminum foil bags which will then be double-bagged with polyethylene bags. Samples to be screened for radioactivity will have the shells opened to allow screening of tissues with an Eberline E120 radiation meter with GM pancake probe for gamma and beta radiation and for alpha radiation with an Eberline ESP-1 portable radiation meter with a scintillation probe. Radioactivity measurements will be recorded and samples will be placed in pre-cleaned polyethylene bags for potential laboratory testing of radioactivity. Samples will be placed in ice chests containing dry ice, quickly frozen, and stored at or below -20° C until analysis.

Mussel tissue will be analyzed for SOCs, pesticides and PCBs, metals, and tributyltin. If the radioactivity screen results in counts greater than background, samples will be tested in the laboratory for confirmation of radioactivity.

Storm Water: Composite storm water runoff samples will be chilled to 4° C during collection and stored at this temperature until used. The samples will be used for the chronic bioassays for determination of potential toxicity within 36 hours of collection. Storm water will be analyzed for inorganics, VOCs, SOCs, pesticides and PCBs and tributyltin.

12.0 CALIBRATION PROCEDURES

The following sections discuss calibration procedures for field equipment used for on-site monitoring and laboratory equipment used for sample analysis.

12.1 Field Equipment

The Eberline E120 radiation meter with GM pancake probe and the Eberline ESP 1 portable radiation survey meter with a scintillation probe will be calibrated at least annually by an individual certified by the state of California to perform such calibrations. Calibration procedures and a calibration certification are presented in Appendix C. The HNU Systems Inc. Photo-ionizer (model PI 101) utilized in organic vapor monitoring will be calibrated with hexane daily prior to use in the field. Calibration procedures are presented in Appendix D. If equipment malfunctions occur, the device will be removed from service and repaired and recalibrated or replaced, as necessary. A record will be kept of all equipment calibration and repairs.

12.2 Laboratory Equipment

Laboratory equipment calibration will be in accordance with EPA-approved analytical methods. This includes initial and daily calibrations according to the specified method. Specific calibration procedures and schedules will be submitted upon laboratory confirmation.

13.0 ANALYTICAL PROCEDURES

Analyses will be performed on environmental samples of test organism tissue, sediment, and storm water. The ESAP has been designed to utilize laboratories with appropriate California state certification and CLP qualifications as appropriate.

The general groups of chemicals to be analyzed for during the ESAP include inorganics/metals, SOCs, pesticides and PCBs, and tributyltin. Storm water and sediment core samples will undergo additional analyses for VOCs. (Parameters for which EPA-approved methods have not been established will be analyzed using a method that meets the objectives of the project.)

Bioassays will also be conducted during the ESAP and include 10-day chronic bioassay (solid phase), liquid suspended particulate phase bioassay, and three-species chronic bioassay. Physical analyses will include sediment grain size. The radioactive particle activity of specified samples will also be measured.

Table 1 identifies the analyses proposed for each type of sample. A summary of sample matrix, analytical methods, analytical constituents, and approximate quantitation limit/reporting limits for samples to be collected as part of the ESAP is presented in Tables 3, 4 and 5.

Both field and laboratory QA/QC procedures will be monitored against written QA/QC protocol.

14.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data handling and reporting procedures will be followed to ensure data management activities provide an accurate controlled flow of data. Field and laboratory generated data will be subject to data management protocol.

14.1 Data Reduction and Recording

Data generated at the laboratory will be presented in specified laboratory format. Specific laboratory data presentation forms will submitted upon laboratory selection.

Data gathered in the field will be maintained in task specific, bound logbooks or on customized data collection sheets. All measurements and calculations will be clearly presented in a logical fashion. The Field Operations Manager will review all field documentation to ensure legibility and completeness.

14.2 Data Validation

Screening and accepting, rejecting, or qualifying data will be part of the validation process. Laboratory data will be validated, as appropriate, based on initial calibration, continuing calibration, holding times, sample blank results, and other QA/QC sample results. Statistical methods will be employed to screen quantitative data and evaluate outliers and determine whether to accept, correct, or reject values. The correction or rejection of any values will be documented.

Field data will be validated in two ways. First, all data will be validated at the time of collection by following standard operating and QA procedures. Where field measurements of radioactivity are higher than background, the samples will be analyzed at the laboratory for radioactivity. Second, data will be validated by the Field Operations Manager and the Quality Assurance Officer, who will review the data to ensure the correct calculations and units have been employed. The Field Operations Manager and Quality Assurance Officer will ensure that defensible data were obtained by adherence to the standard sample collection procedures, QA procedures, and COC procedures. Validation of analytical data will primarily be in conformance with EPA's "Functional Guidelines for Data Evaluation" (EPA, 1987, 1985).

14.3 Data Reporting

Reduced and validated data will be reported in comprehensive and self-explanatory tables in the final ESAP report. Data and conclusions drawn from the data will also be discussed in the text of the ESAP report.

15.0 QUALITY CONTROL CHECKS

Two types of QC checks will be employed, field checks and laboratory checks. These checks are represented by the control samples collected and introduced into the sample analysis stream. The number of control samples is determined by the size of the sample lots. All QC samples will be shipped according to specified COC procedures.

15.1 Field QC Checks

Field QC checks are accomplished by submission of control samples to the laboratory. The QC samples are introduced blind to the laboratory from the field. Field QC samples will include trip blanks, rinsate blanks, field blanks, and field duplicates.

A trip blank consists of a sealed container of analyte water that travels from the field to the laboratory with the liquid samples to be analyzed for VOCs. The trip blank identifies contamination that may have been contributed to the field samples during transport by receiving the sample treatment as sample containers. It is estimated that one trip blank will be submitted to the laboratory at a minimum frequency of one per shipping container per laboratory during storm water sampling.

A field duplicate consists of a duplicate sample from one sampling location. Duplicates will be collected for liquid samples only. One duplicate sample will be collected and submitted per 20 samples (or one per day, whichever is greater) per laboratory. It is estimated that one duplicate will be collected during storm water sampling.

An equipment rinsate blank consists of final rinse water from the decontamination of field sampling equipment. The analysis of equipment rinsate evaluates whether the decontamination procedures are adequate to avoid carry-over of contamination from one sampling location to another. Equipment rinsate samples will be collected for each piece of sampling equipment utilized. A minimum of two equipment rinsate blanks per week will be collected to evaluate the adequacy of the decontamination procedures. It is estimated that 4 rinsate blanks will be collected during the sediment sampling and one will be collected during the storm water sampling. Rinsate samples will be analyzed for the same constituents as the corresponding field samples.

A field blank consists of the source water used for decontamination purposes. This sample is analyzed on a frequency of one per sampling event. It is estimated that two field blanks will be analyzed during the implementation of the ESAP; one will be collected during the sediment sampling and another during the storm water sampling. The samples will be analyzed for the same constitituents as the corresponding field samples.

15.2 Laboratory QC Checks

Laboratory procedures and requirements for QC will be monitored by the individual laboratories. Laboratories will ensure the generation of analytical data with known quality. The number of QC samples specified in the approved analytical methods will be utilized by the laboratories. Laboratory QC samples analyzed include method blanks, matrix spikes, matrix spike duplicates, surrogates, sample duplicates, initial and continuing calibration checks, and laboratory control samples. The Quality Control Officer and the Project Manager will examine and discuss the QC information provided by the laboratory as a QC review for data. The results of blank, spike, and duplicate sample analysis will be presented in a QA report as part of the ESAP report.

16.0 QUALITY ASSURANCE AUDITS

During the course of the environmental sampling and analysis program, audits of the field and analytical programs will be performed. Audit procedures assess and document the performance of all aspects of the ESAP. A field audit and a sampling and analyses audit will be performed for each task of the ESAP. These task units include the sediment grab and core sampling program, the mussel deployment program, and the stormwater sampling program. The results of each audit will be presented in a QA report as part of the ESAP final report.

Audits will be performed by the Quality Assurance Officer. The field audit focuses on whether sampling and coring procedures outlined previously in this report have been followed. The sampling and analyses audit will focus on QA/QC procedures, sampling and analysis procedures, and documentation and COC procedures. If the QA Officer identifies discrepancies or problems, a corrective action request will be submitted to the Project Manager. The Project Manager will receive all corrective action requests. Completeness of corrective action is verified by the QA Officer and the Project Manager.

17.0 PREVENTIVE MAINTENANCE

Routine maintenance inspections will be scheduled to keep all field and laboratory equipment in proper working condition and to minimize equipment breakdown.

17.1 Field Equipment

All field sampling equipment will be thoroughly inspected prior to use. The radiation meters will be inspected and tested by the distributor prior to shipment out of the warehouse. Field personnel will maintain records of field equipment failure, service, and calibration. Excess sampling equipment will be kept on hand in the event of equipment breakage.

17.2 Laboratory Equipment

A QC system will be maintained by the laboratories indicating the date and time of scheduled inspections, the name and position of the inspector, date of scheduled maintenance, and corrective action, if warranted. Inspection and maintenance records will be maintained at the laboratories. More information concerning laboratory equipment maintenance is described in laboratory SOPs (or in the laboratory QAPP).

18.0 DATA ASSESSMENT PROCEDURES

QA/QC procedures will be applied to assess the validity of the analytical data derived from the sampling and analysis tasks presented in the ESAP. A statistical evaluation of laboratory analytical data will apply accuracy, precision and completeness criteria for the parameters analyzed. Statistical analysis of field QC samples will be used to evaluate the field sampling and handling procedures. The data will be evaluated according to the following criteria:

Accuracy - defined as the degree of agreement of a measurement with an accepted reference or true value. Accuracy is assessed by splitting a sample into two portions. Known quantities of specific chemicals of interest are added to one portion, and both portions are analyzed for the specific chemical parameters. This procedure is called "spiking" and is used to evaluate data accuracy. The percent recovery for each spiking compound is calculated as follows:

$$\% \text{ Recovery} = \frac{(T - X)}{A} \times 100$$

Where: T= observed spiked sample concentration
X= original sample concentration
A= actual concentration of the spike added to the sample

One hundred percent recovery is equivalent to one hundred percent accuracy, where the difference in the concentrations of interest is equal to the quantity of spike added to one of the portions.

The percent recovery data for each spiking compound is compared to QC goals. The compound data that falls outside QC goals will be evaluated, the laboratory notified and corrective action taken as appropriate.

The quality assurance goals for accuracy are as follows:

Spike Sample Analysis	Acceptable Percent Recovery (percent)	
	Water	Soil
Metals	70-130	70-130
SOCs	10-130	20-150
Pesticides/PCBs	30-140	20-140
VOCs	60-150	50-180

Precision - defined as the measure of mutual agreement among individual measurements of the same property, usually prescribed under similar conditions. Precision is assessed by conducting

analyses on field and laboratory duplicate samples. Field QA/QC duplicate samples are collected from the same sampling location by the same sampling method, and both samples are submitted to the laboratory for analysis. Laboratory QA/QC duplicate samples represent a field sample that is mixed into a homogenous mixture in the laboratory. The samples are then split and analyzed in duplicate.

A measurement of the agreement in the reported values of the two samples is obtained by calculating the relative percent difference (RPD) in the concentration level of each constituent. RPD is calculated as follows:

$$RPD = \frac{(X_1 - X_2)}{\overline{X}} \times 100$$

Where: X^1 = concentration of sample number one of the duplicate
X^2 = concentration of sample number two of the duplicate

$\overline{X}$ = mean of samples one and two

The relative percent difference is compared to QC goals. Data which falls outside QC goals limits will be evaluated and the analytical laboratory notified for appropriate corrective action.

The quality assurance goals for precision are as follows:

Duplicate Analysis	Acceptable RPD (percent)	
	Water	Soil
Metals	30	40
SOCs	40	50
Pesticides/PCBs	30	50
VOCs	20	30

Completeness - defined as the amount of valid data obtained from a measurement system compared to the amount of data that was expected and needed to be obtained to attain project data goals. An assessment of the completeness of the data will be made, which involves computing the fraction of the reported values that remain valid after sampling procedures have been reviewed and the analytical results assessed for precision and accuracy. The quality assurance goal for completeness is 90 percent.

19.0 CORRECTIVE ACTION

A request for corrective action will be made in the event that field or laboratory measurement error has occurred, or after notice of an audit deficiency.

19.1 Field Activities

Two types of corrective action can be requested in the field: immediate and long-term. Immediate corrective action involves items such as the correction of operating procedures, repair of equipment, or amending errors in documentation procedures. Long-term corrective

action involves the elimination of source problems by correcting systematic errors in sampling or analysis procedures.

The Project Manager will retain copies of all requests for corrective action. The Quality Assurance Officer will investigate the completeness of corrective action.

19.2 Laboratory Activities

If a laboratory analyst observes that instruments are not within calibration limits, the instruments will be recalibrated. Samples analyzed between the last acceptable calibration date and the date the discrepancy was noticed will be reanalyzed once an acceptable calibration has been obtained. Problems occurring in laboratory QC samples will be reported to the laboratory supervisor, who will immediately notify the project Quality Control Officer. Corrective action will immediately be taken to remediate laboratory discrepancies.

20.0 QUALITY ASSURANCE REPORTS

A quality assurance report will be prepared by the Quality Assurance Officer and presented as part of the ESAP report. The QA report will include the results of field QA/QC audits, requests and completion records for corrective action, laboratory QA/QC procedures, and QA/QC statistical evaluations. The report will include a general overall assessment of the performance of the field and laboratory programs implemented in the ESAP.

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TABLES

HEALTH AND SAFETLY PLAN ENVIROMENTAL SAMPLING AND ANALYSIS PLAN

DATED 03 APRIL 1991

Table 1. Sampling and Analytical Program

ATT

Evaluation Program and Sample Location Numbers	Number of Samples[a]	Media Type[b]	Radio-Activity Screen	Toxicity Testing	Physical Testing[c]	Radio-Activity Testing	Inorganics/ Metals	Pesticides/ PCBs	Semi-Volatile Organics	Tributyltin	Volatile Organics
Sediment Toxicity											
S-1 to S-17	17	S	X	X[d]	X	X[e]	X	X	X	X[f]	--
Reference	2	S	X	X	X	X[e]	X	X	X	X[f]	--
Control	1	S	X	X	X	--	--	--	--	--	--
Sediment Cores	19	S	X	--	--	X[e]	X	X	X	X[f]	X
Bioaccumulative Effect											
M-1 to M-17	17	T	X	--	--	X[e]	X	X	X	X[f]	--
Background	1	T	X	--	--	--	X	X	X	X[f]	--
Reference	3	T	X	--	--	--	X	X	X	X[f]	--
Storm Water Toxicity											
ST1 to ST4	4	SW	--	X[g]	--	--	X[h]	X[h]	X[h]	X[h]	X[h]
B-1 to B-4	4	BW	--	X[g]	--	--	X[h]	X[h]	X[h]	X[h]	X[h]
Reference	1	BW	--	X[g]	--	--	--	--	--	--	--

a These numbers describe composited samples and do not include sub-samples removed for screening of radioactivity, toxicity testing, physical testing, chemical analyses, or Quality Control (QC) samples
b Media Type: S = sediment, T = tissue, SW = storm water, BW = bay water
c Physical testing includes determination of grain size
d Toxicity testing of sediment samples involves the use of five replicates in 10-day solid phase bioassays and liquid suspended particulate phase bioassays
e Laboratory testing of radioactivity will be conducted on samples exhibiting radioactivity above background levels as determined by radioactivity screening
f Analytical method: n - Pentyl Derivitization with Gas Chromatography/Flame Photometric Detection
g Toxicity testing of storm and bay water samples involves a five dilution series
h Analysis of storm water samples will be conducted as described in the Proposed Reconnaissance Study of Storm Water Quality (HLA, 1988g)

Table 2. Sample Handling Program

Sample Matrix and Analytes	Sample Volumes[a]	Sample Containers	Preservation Methods	Maximum Holding Times[b]
Sediment Samples				
VOCs[c]	10 grams	CAB tubes	Chill to 4° C	14 days/40 days
SOCs	10 grams	Glass jars or CAB tubes	Chill to 4° C	14 days/40 days
Inorganics	10 grams	Polyethylene jars or CAB tubes	Chill to 4° C	6 months (except Hg:28 days)
Pesticides & PCBs	10 grams	Glass jars or CAB tubes	Chill to 4° C	14 days/40 days
Tributyltin	10 grams	Polyethylene jars or CAB tubes	Chill to 4° C	28 days
Radiation	10 grams	Glass jars or CAB tubes	Chill to 4° C	6 months
Mussel Tissue Samples				
SOCs	10 grams	Heat Cleaned ZIPLOCK® bags with aluminum foil	Freeze to ≤- 20° C	14 days/40 days
Metals	10 grams	MICRO® detergent cleaned double ZIPLOCK® bags	Freeze to ≤- 20° C	6 months (except Hg: 28 days)
Pesticides & PCBs	10 grams	Hexane rinsed ZIPLOCK® bags with double aluminum foil	Freeze to ≤- 20° C	14 days/40days
Tributyltin	10 grams	MICRO® detergent cleaned double ZIPLOCK® bags	Freeze to ≤- 20° C	28 days
Radiation	10 grams	Widemouth plastic jars	Chill to 4° C	10 days
Storm Water Samples				
VOCs	40 mls	Glass jars	Chill to 4° C HCl to pH 2	14 days
SOCs	1 liter	Glass jars	Chill to 4° C	7 days/40 days
Inorganics	200 mls	Polyethylene or Glass jars	Chill to 4° C HNO_3 to pH <2	6 months (except Hg:28 days)
Pesticides & PCBs	1 liter	Glass jars	Chill to 4° C	7 days/40 days

Table 2. Sample Handling Program (continued)

Sample Matrix and Analytes	Sample Volumes[a]	Sample Containers	Preservation Methods	Maximum Holding Times[b]
Tributyltin	1 liter	Polyethylene or Glass Jars	Chill to 4° C	28 days

a. These are the volumes required for analysis. To insure that the laboratory has sufficient amounts of sample, at least two times as much volume should be sent to the laboratory. Extra volume must also be provided for laboratory QC samples (matrix spike/matrix spike duplicate).
b. x days/y days = x is the extraction holding time,
y is the holding time for analysis of the extracts
c. VOC analysis to be performed on sediment core samples only.
d. NA = Not applicable

Table 3. Analytical Methods for Sediment Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
S-1 - S-17	Sediment	CLP Inorganics	Aluminum	10.0
			Antimony	3.0
			Arsenic	0.5
			Barium	10.0
			Beryllium	0.25
			Cadmium	0.25
			Calcium	250.0
			Chromium (total)	0.5
			Cobalt	0.5
			Copper	0.5
			Iron	5.0
			Lead (total)	0.15
			Magnesium	250.0
			Manganese	0.75
			Mercury	0.01
			Molybdenum	0.50
			Nickel	2.0
			Potassium	250.0
			Selenium	0.25
			Silver	0.5
			Sodium	250.0
			Thallium	0.5
			Tin	0.25
			Vanadium	2.5
			Zinc	1.0
		CLP Pesticides/PCBs	alpha-BHC	8.0
			beta-BHC	8.0
			gamma-BHC (Lindane)	8.0
			delta-BHC	8.0
			Heptachlor	8.0
			Aldrin	8.0
			Heptachlor epoxide	8.0

Table 3. Analytical Methods for Sediment Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
			Endosulfan I	8.0
			p,p'-DDE	16.0
			Dieldrin	16.0
			Endrin	16.0
			p,p'-DDD	16.0
			Endosulfan II	16.0
			p,p'-DDT	16.0
			Endrin aldehyde	16.0
			Endosulfan sulfate	16.0
			p,p'-Methoxychlor	80.0
			Endrin ketone	16.0
			Technical chlordane	80.0
			Toxaphene	160.0
			Aroclor 1016	80.0
			Aroclor 1221	80.0
			Aroclor 1232	80.0
			Aroclor 1242	80.0
			Aroclor 1248	80.0
			Aroclor 1254	160.0
			Aroclor 1260	160.0
		CLP SOCs	Phenol	330
			bis(2-Chloroethyl) Ether	330
			2-Chlorophenol	330
			1,3-Dichlorobenzene	330
			1,4-Dichlorobenzene	330
			Benzyl Alcohol	330
			1,2-Dichlorobenzene	330
			2-Methylphenol	330
			bis(2-Chloroisopropyl) Ether	330
			4-Methylphenol	330

Table 3. Analytical Methods for Sediment Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
			N-Nitroso-di-n-Propylamine	330
			Hexachloroethane	330
			Nitrobenzene	330
			Isophorone	330
			2-Nitrophenol	330
			2,4-Dimethylphenol	330
			Benzoic Acid	1600
			bis(2-Chloroethoxy)Methane	330
			2,4-Dichlorophenol	330
			1,2,4-Trichlorobenzene	330
			Naphthalene	330
			4-Chloroaniline	330
			Hexachlorobutadiene	330
			4-Chloro-3-Methylphenol	330
			2-Methylnaphthalene	330
			Hexachlorocyclopentadiene	330
			2,4,6-Trichlorophenol	330
			2,4,5-Trichlorophenol	1600
			2-Chloronaphthalene	330
			2-Nitroaniline	1600
			Dimethylphthalate	330
			Acenaphthylene	330
			3-Nitroaniline	1600
			Acenaphthene	330
			2,4-Dinitrophenol	1600
			4-Nitrophenol	1600
			Dibenzofuran	330
			2,4-Dinitrotoluene	330
			2,6-Dinitrotoluene	330
			Diethylphthalate	330

Table 3. Analytical Methods for Sediment Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
			4-Chlorophenyl-Phenyl Ether	330
			Fluorene	330
			4-Nitroaniline	1600
			4,6-Dinitro-2-Methylphenol	330
			N-Nitrosodiphenylamine	330
			Azobenzene	330
			4-Bromophenyl-Phenyl Ether	330
			Hexachlorobenzene	330
			Pentachlorophenol	1600
			Phenanthrene	330
			Anthracene	330
			Di-n-Butylphthalate	330
			Fluoranthene	330
			Benzidine	1600
			Pyrene	330
			Butylbenzylphthalate	330
			3,3'-Dichlorobenzidine	660
			Benzo(a)Anthracene	330
			bis(2-Ethylhexl)phthalate	330
			Chrysene	330
			Di-n-Octylphthalate	330
			Benzo(b)Fluoranthene	330
			Benzo(k)Fluoranthene	330
			Benzo(a)Pyrene	330
			Indeno(1,2,3-cd)Pyrene	330
			Dibenz(a,h)Anthracene	330
			Benzo(g,h,i)Perylene	330

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
		GC/FPD[a] with n-pentyl-derivization Radiation	Tributyltin	10
		EPA Method 9310	Alpha	2[b]
		EPA Method 9310	Beta	4[b]
		Spectroscopy	Gamma	0.5[b]
	Sediment[c]	CLP VOCs	Chloromethane	10
			Vinyl Chloride	10
			Bromomethane	10
			Chloroethane	10
			Trichlorofluoromethane	5
			1,1-Dichloroethene	5
			Trichlorotrifluoroethane	5
			Acetone	20
			Carbondisulfade	5
			Methylene Chloride	5
			trans-1,2-Dichloroethene	5
			1,1-Dichloroethane	5
			2-Butanone	20
			cis-1,2-Dichloroethene	5
			Chloroform	5
			1,1,1-Trichloroethane	5
			Carbon Tetrachloride	5
			Benzene	5
			1,2-Dichloroethane	5
			Trichloroethene	5
			1,2-Dichloropropane	5
			Bromodichloromethane	5
			2-Chloroethylvinyl Ether	5
			Vinyl Acetate	10
			trans-1,3-Dichloropropene	5
			4-Methyl-2-Pentanone	10

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/Kg)
			Toluene	5
			cis-1,3-Dichloropropene	5
			1,1,2-Trichloroethane	5
			Tetrachloroethene	5
			2-Hexanone	10
			Dibromochloromethane	5
			Chlorobenzene	5
			Ethylbenzene	5
			Total Xylenes	5
			Styrene	5
			Bromoform	5
			1,1,2,2-Tetrachloroethane	5
			1,3-Dichlorobenzene	5
			1,4-Dichlorobenzene	5
			1,2-Dichlorobenzene	5

a. Gas chromatography/flame photometric detection
b. Radiation units are picocuries/gram (pCi/gm)
c. Analysis for VOCs will be performed on sediment core samples only.

Table 4. Analytical Methods for Mussel Tissue Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Reporting Limit (µg/Kg)
M-1 - M-17	Mussel Tissue	Metals - 6010/ICP[a]	Aluminum	200
			Antimony	60
		7060/AA[b]	Arsenic	NA
			Barium	100
			Beryllium	10
			Cadmium	10
			Calcium	1000
			Chromium (total)	10
			Cobalt	50
			Copper	25
			Iron	100
		7421/AA[b]	Lead (total)	40
			Magnesium	1000
			Manganese	15
			Molybdenum	10
			Nickel	40
			Potassium	1000
		7740/AA[b]	Selenium	NA
			Silver	10
			Sodium	1000
		7841/AA[b]	Thallium	80
			Tin	40
			Vanadium	50
			Zinc	20
		7471/Cold Vapor AA[b]	Mercury	10
		Pest/PCBs - 8080/GC/MS[c]	alpha-BHC	NA
			beta-BHC	NA
			gamma-BHC (Lindane)	NA
			delta-BHC	NA

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Reporting Limit (µg/Kg)
			Heptachlor	NA
			Aldrin	NA
			Heptachlor epoxide	NA
			Endosulfan I	10.0
			p,p'-DDE	NA
			Dieldrin	2.0
			Endrin	2.0
			p,p'-DDD	NA
			Endosulfan II	2.0
			p,p'-DDT	NA
			Endrin aldehyde	NA
			Endosulfan sulfate	25.0
			p,p'-Methoxychlor	NA
			Endrin ketone	NA
			Technical chlordane	25.0
			Toxaphene	30.0
			Aroclor 1016	20.0
			Aroclor 1221	20.0
			Aroclor 1232	20.0
			Aroclor 1242	20.0
			Aroclor 1248	20.0
			Aroclor 1254	20.0
			Aroclor 1260	20.0
		SOCs - 8270/GC/MS[c]	Phenol	160.0
			bis(2-Chloroethyl) Ether	160.0
			2-Chlorophenol	160.0
			1,3-Dichlorobenzene	160.0
			1,4-Dichlorobenzene	160.0
			Benzyl Alcohol	160.0
			1,2-Dichlorobenzene	160.0
			2-Methylphenol	160.0

Table 4. Analytical Methods for Mussel Tissue Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Reporting Limit (µg/Kg)
			bis(2-Chloroisopropyl) Ether	160.0
			4-Methylphenol	160.0
			N-Nitroso-di-n-Propylamine	160.0
			Hexachloroethane	160.0
			Nitrobenzene	160.0
			Isophorone	160.0
			2-Nitrophenol	160.0
			2,4-Dimethylphenol	160.0
			Benzoic Acid	800.0
			bis(2-Chloroethoxy)Methane	160.0
			2,4-Dichlorophenol	160.0
			1,2,4-Trichlorobenzene	160.0
			Naphthalene	160.0
			4-Chloroaniline	160.0
			Hexachlorobutadiene	160.0
			4-Chloro-3-Methylphenol	160.0
			2-Methylnaphthalene	160.0
			Hexachlorocyclopentadiene	160.0
			2,4,6-Trichlorophenol	160.0
			2,4,5-Trichlorophenol	800.0
			2-Chloronaphthalene	160.0
			2-Nitroaniline	800.0
			Dimethylphthalate	160.0
			Acenaphthylene	160.0
			3-Nitroaniline	800.0
			Acenaphthene	160.0
			2,4-Dinitrophenol	800.0
			4-Nitrophenol	800.0
			Dibenzofuran	160.0
			2,4-Dinitrotoluene	160.0
			2,6-Dinitrotoluene	160.0
			Diethylphthalate	160.0

Table 4. Analytical Methods for Mussel Tissue Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Reporting Limit (µg/Kg)
			4-Chlorophenyl-Phenyl Ether	160.0
			Fluorene	160.0
			4-Nitroaniline	800.0
			4,6-Dinitro-2-Methylphenol	800.0
			N-Nitrosodiphenylamine	160.0
			Azobenzene	160.0
			4-Bromophenyl-Phenyl Ether	160.0
			Hexachlorobenzene	160.0
			Pentachlorophenol	800.0
			Phenanthrene	160.0
			Anthracene	160.0
			Di-n-Butylphthalate	160.0
			Fluoranthene	160.0
			Benzidine	800.0
			Pyrene	160.0
			Butylbenzylphthalate	160.0
			3,3'-Dichlorobenzidine	320.0
			Benzo(a)Anthracene	160.0
			bis(2-Ethylhexl)phthalate	160.0
			Chrysene	160.0
			Di-n-Octylphthalate	160.0
			Benzo(b)Fluoranthene	160.0
			Benzo(k)Fluoranthene	160.0
			Benzo(a)Pyrene	160.0
			Indeno(1,2,3-cd)Pyrene	160.0
			Dibenz(a,h)Anthracene	160.0
			Benzo(g,h,i)Perylene	160.0

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Reporting Limit (µg/Kg)
		GC/FPD[d] with n-pentyl-derivitization	Tributyltin	100
		Radiation EPA Method 9310	Alpha	4[e]
		EPA Method 9310	Beta	2[e]
		Spectroscopy	Gamma	0.5[e]

a. ICP; Inductively Coupled Plasma Spectroscopy
b. AA; Atomic Absorption
c. GC/MS; Gas Chromatography/Mass Spectroscopy
d. GC/FPD; Gas Chromatography/Flame Photometric Detection
e. Radiation units are picocuries/gram (pCi/gm)
NA - Not available

Table 5. Analytical Methods for Storm Water Runoff Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/L)
ST-1 - ST-4 B-1 - B-4	Water	CLP Inorganics	Aluminum	200.0
			Antimony	3.0
			Arsenic	10
			Barium	100.0
			Beryllium	5.0
			Cadmium	5.0
			Calcium	1000
			Chromium (total)	10.0
			Cobalt	50.0
			Copper	25
			Iron	100
			Lead (total)	3.0
			Magnesium	1000
			Manganese	15.0
			Mercury	0.5
			Molybdenum	10.0
			Nickel	40.0
			Potassium	1000
			Selenium	5.0
			Silver	10.0
			Sodium	1000
			Thallium	10.0
			Tin	40.0
			Vanadium	50.0
			Zinc	20.0
		CLP Pesticides/PCBs	alpha-BHC	0.05
			beta-BHC	0.05
			gamma-BHC (Lindane)	0.05
			delta-BHC	0.05
			Heptachlor	0.05
			Aldrin	0.05

Table 5. Analytical Methods for Storm Water Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/L)
			Heptachlor epoxide	0.05
			Endosulfan I	0.1
			p,p'-DDE	0.1
			Dieldrin	0.1
			Endrin	0.1
			p,p'-DDD	0.1
			Endosulfan II	0.1
			p,p'-DDT	0.1
			Endrin aldehyde	0.1
			Endosulfan sulfate	0.1
			p,p'-Methoxychlor	0.5
			Endrin ketone	0.1
			Technical chlordane	0.5
			Toxaphene	1.0
			Aroclor 1016	0.5
			Aroclor 1221	0.5
			Aroclor 1232	0.5
			Aroclor 1242	0.5
			Aroclor 1248	0.5
			Aroclor 1254	1.0
			Aroclor 1260	1.0
		CLP SOCs	Phenol	10
			bis(2-Chloroethyl) Ether	10
			2-Chlorophenol	10
			1,3-Dichlorobenzene	10
			1,4-Dichlorobenzene	10
			Benzyl Alcohol	10
			1,2-Dichlorobenzene	10
			2-Methylphenol	10
			bis(2-Chloroisopropyl) Ether	10
			4-Methylphenol	10

Table 5. Analytical Methods for Storm Water Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/L)
			N-Nitroso-di-n-Propylamine	10
			Hexachloroethane	10
			Nitrobenzene	10
			Isophorone	10
			2-Nitrophenol	10
			2,4-Dimethylphenol	10
			Benzoic Acid	50
			bis(2-Chloroethoxy)Methane	10
			2,4-Dichlorophenol	10
			1,2,4-Trichlorobenzene	10
			Naphthalene	10
			4-Chloroaniline	10
			Hexachlorobutadiene	10
			4-Chloro-3-Methylphenol	10
			2-Methylnaphthalene	10
			Hexachlorocyclopentadiene	10
			2,4,6-Trichlorophenol	10
			2,4,5-Trichlorophenol	50
			2-Chloronaphthalene	10
			2-Nitroaniline	50
			Dimethylphthalate	10
			Acenaphthylene	10
			3-Nitroaniline	50
			Acenaphthene	10
			2,4-Dinitrophenol	50
			4-Nitrophenol	50
			Dibenzofuran	10
			2,4-Dinitrotoluene	10
			2,6-Dinitrotoluene	10
			Diethylphthalate	10

Table 5. Analytical Methods for Storm Water Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/L)
			4-Chlorophenyl-Phenyl Ether	10
			Fluorene	10
			4-Nitroaniline	50
			4,6-Dinitro-2-Methylphenol	10
			N-Nitrosodiphenylamine	10
			Azobenzene	10
			4-Bromophenyl-Phenyl Ether	10
			Hexachlorobenzene	10
			Pentachlorophenol	50
			Phenanthrene	10
			Anthracene	10
			Di-n-Butylphthalate	10
			Fluoranthene	10
			Benzidine	50
			Pyrene	10
			Butylbenzylphthalate	10
			3,3'-Dichlorobenzidine	20
			Benzo(a)Anthracene	10
			bis(2-Ethylhexl)phthalate	10
			Chrysene	10
			Di-n-Octylphthalate	10
			Benzo(b)Fluoranthene	10
			Benzo(k)Fluoranthene	10
			Benzo(a)Pyrene	10
			Indeno(1,2,3-cd)Pyrene	10
			Dibenz(a,h)Anthracene	10
			Benzo(g,h,i)Perylene	10
		GC/FPD[a] with n-pentyl-derivitization	Tributyltin	10

Table 5. Analytical Methods for Storm Water Analyses

Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (µg/L)
ST1-ST4	Water	CLP VOCs	Chloromethane	10
			Vinyl Chloride	10
			Bromomethane	10
			Chloroethane	10
			Trichlorofluoromethane	5
			1,1-Dichloroethene	5
			Trichlorotrifluoroethane	5
			Acetone	20
			Carbondisulfide	5
			Methylene Chloride	5
			trans-1,2-Dichloroethene	5
			1,1-Dichloroethane	5
			2-Butanone	20
			cis-1,2-Dichloroethene	5
			Chloroform	5
			1,1,1-Trichloroethane	5
			Carbon Tetrachloride	5
			Benzene	5
			1,2-Dichloroethane	5
			Trichloroethene	5
			1,2-Dichloropropane	5
			Bromodichloromethane	5
			2-Chloroethylvinyl Ether	5
			Vinyl Acetate	10
			trans-1,3-Dichloropropene	5
			4-Methyl-2-Pentanone	10
			Toluene	5
			cis-1,3-Dichloropropene	5
			1,1,2-Trichloroethane	5
			Tetrachloroethene	5
			2-Hexanone	10

Table 5. Analytical Methods for Storm Water Analyses

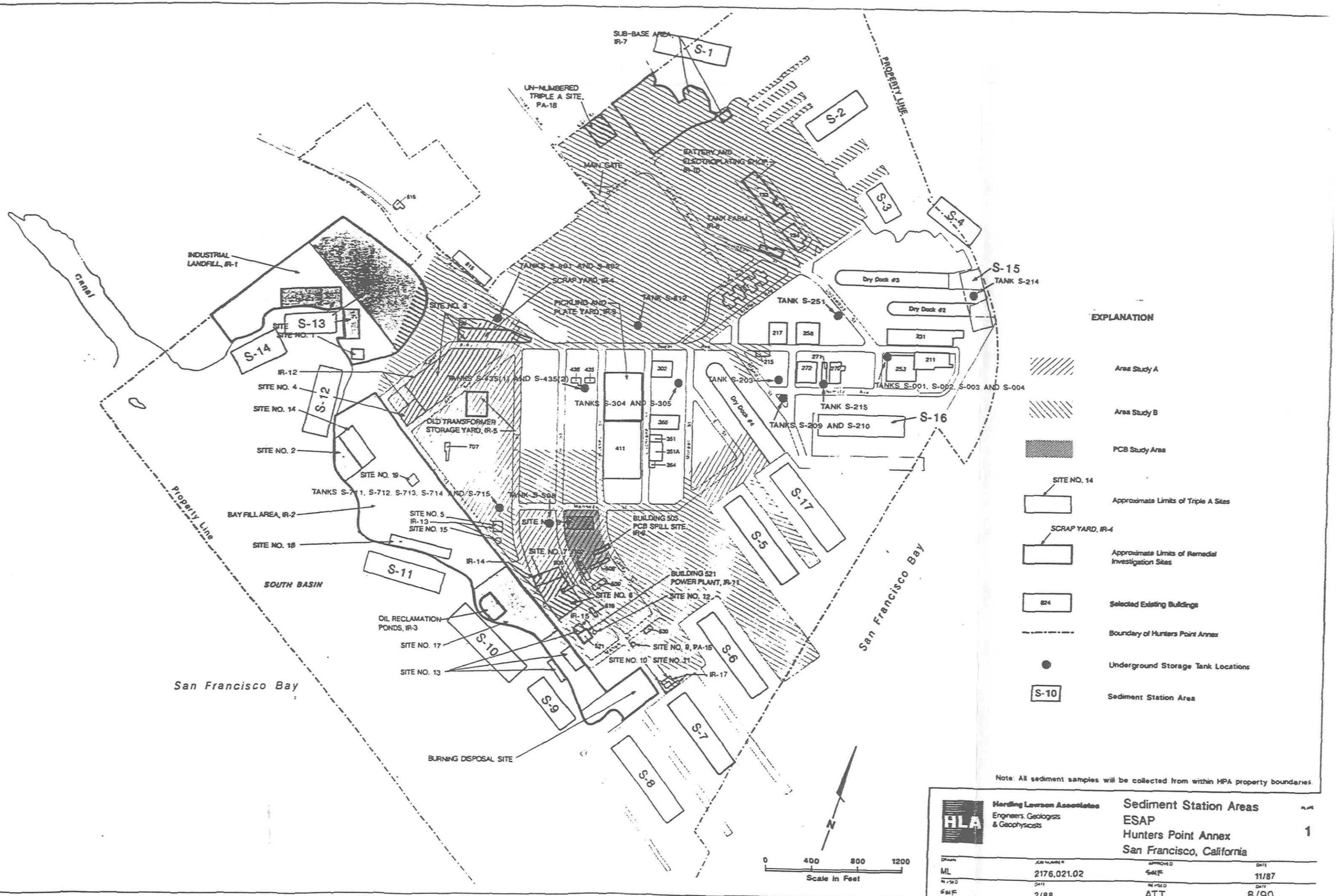
Sample Numbers	Sample Matrix	Analytical Method	Analytical Constituents	Approximate Quantitation Limits (μg/L)
			Dibromochloromethane	5
			Chlorobenzene	5
			Ethylbenzene	5
			Total Xylenes	5
			Styrene	5
			Bromoform	5
			1,1,2,2-Tetrachloroethane	5
			1,3-Dichlorobenzene	5
			1,4-Dichlorobenzene	5
			1,2-Dichlorobenzene	5

a. Gas chromatography/flame photometric detection

PLATES

HEALTH AND SAFETLY PLAN ENVIROMENTAL SAMPLING AND ANALYSIS PLAN

DATED 03 APRIL 1991



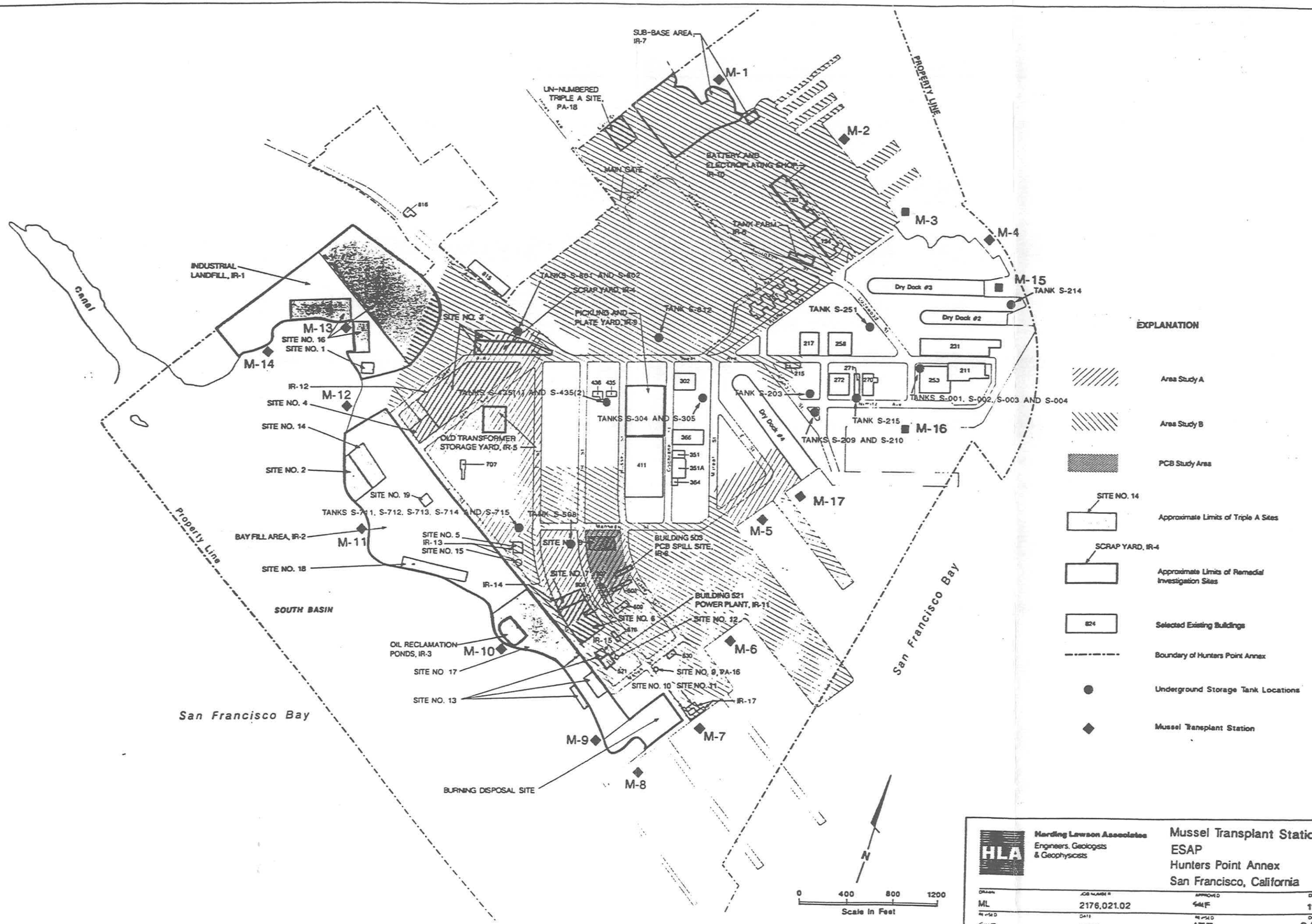
Note: All sediment samples will be collected from within HPA property boundaries.

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Sediment Station Areas
ESAP
Hunters Point Annex
San Francisco, California

PLATE 1

DRAWN	JOB NUMBER	APPROVED	DATE
ML	2176.021.02	SMF	11/87
REVISED	DATE	REVISED	DATE
SMF	2/88	ATT	8/90

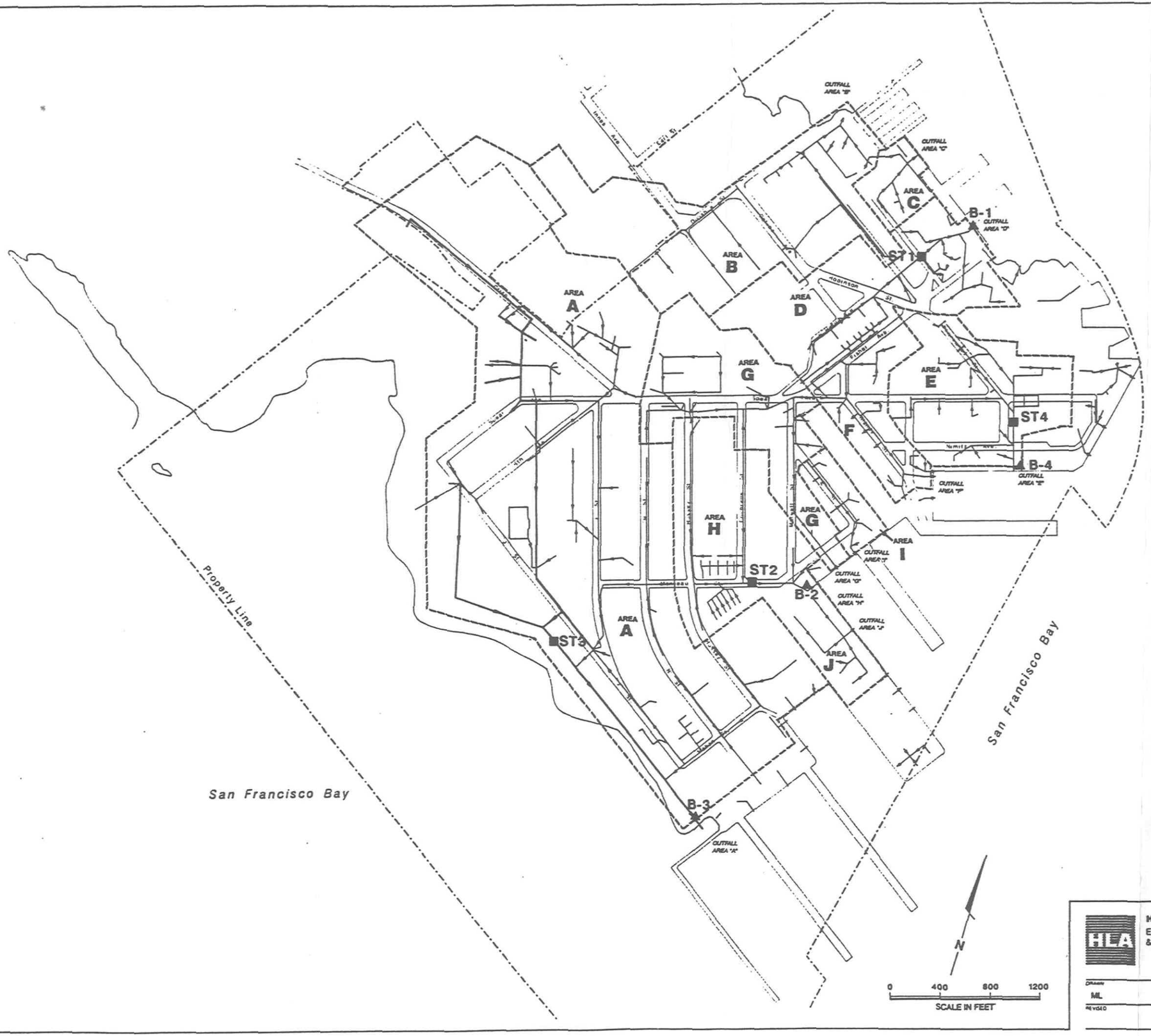


Harding Lawson Associates
Engineers, Geologists & Geophysicists

Mussel Transplant Station
ESAP
Hunters Point Annex
San Francisco, California

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE
ML	2176.021.02	GWF	11/87
REVISED	DATE	REVISED	DATE
GWF	2/88	ATT	8/90



EXPLANATION

- Existing Pipe
- New Pipe
- Boundaries for Drainage Area
- ■ Storm Water Sampling Point
- ▲ Bay Water Sampling Point

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Water Sampling Points
ESAP
Hunters Point Annex
San Francisco, California

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE
ML	2176,253.02		
REVISED	DATE	REVISED	DATE
	12/89	ATT	8/90

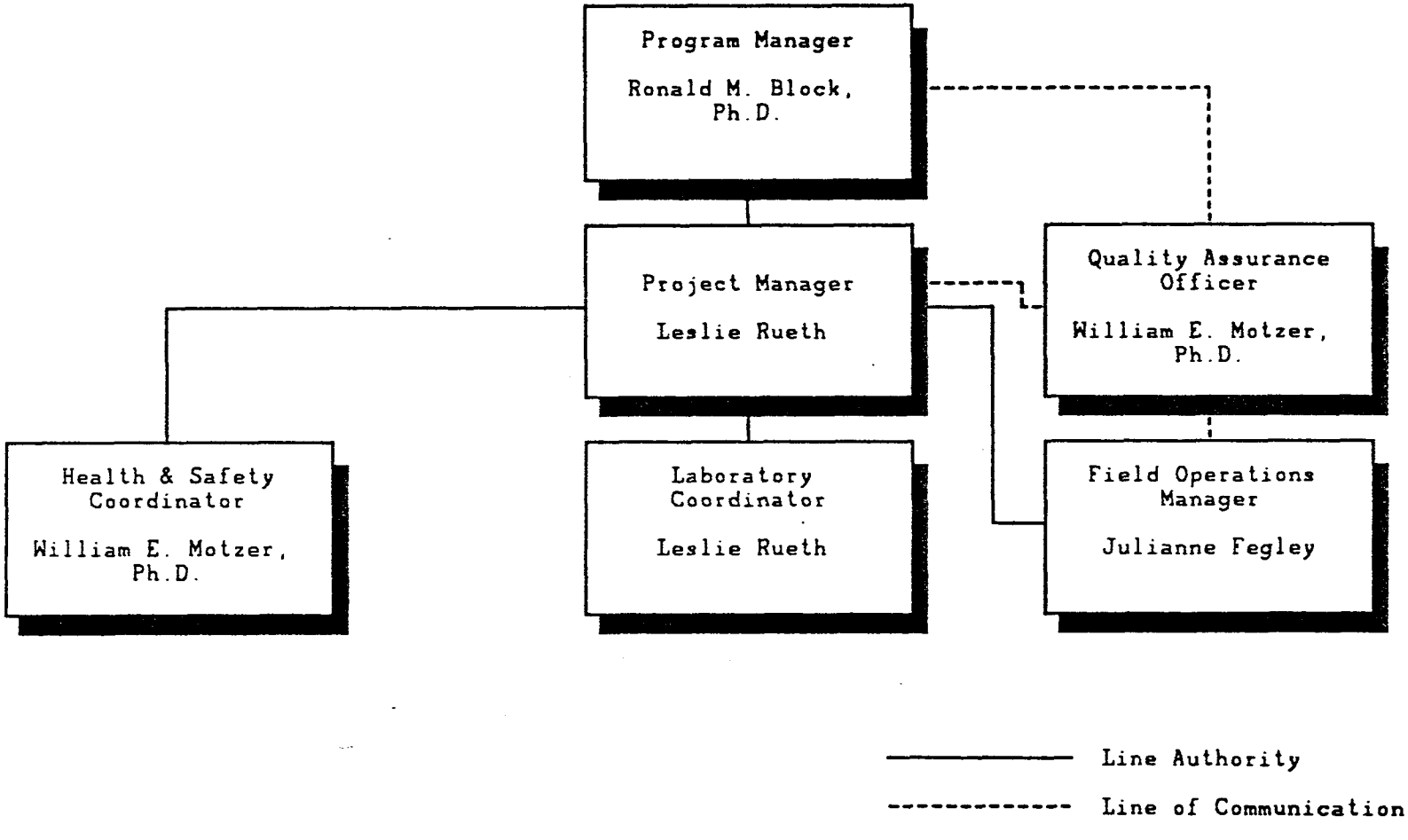
16340

APPENDIX A

Project Organization Flow Chart

ATT

Project Organization Flow Chart



APPENDIX B

Chain of Custody Record

Aqua Terra Technologies, Inc.
2950 Buskirk Avenue, Ste. 120
Walnut Creek, CA 94596
Tel. (415) 934-4884
Fax. (415) 934-0418

ATT

CHAIN OF SAMPLE CUSTODY RECORD

(original document, please return)

Page _____ of _____

Sampled By: _____ Date Sampled: _____

Signature: _____ ATT Job #: _____

Lab Name: _____

Results To Be Sent To: _____ Contact: _____

Results Needed By: _____ Phone #: _____

Fax Results ASAP ☐ Lab Job #: _____

Sample Collection				Sample Preservation				Sample Containers				Analysis/EPA Method No.						
Sample I.D.	Time (24 hr)	Matrix (e.g. Water, Soil)	Number of Containers	Ice	HCL	Dry Ice												Remarks

Notes:

Relinquished by/ Company Affiliation	Date	Time	Received by: Company Affiliation	Date	Time

APPENDIX C

Radiation Survey Meter
Calibration Procedures and Certification

NWT *BRINGING YOU THE TECHNOLOGY OF THE NEW WORLD*

phone (415) 443-7967
fax ~~(415) 449-4647~~

DATE: Feb 26, 91

TO: Kimberly

COMPANY: Aqua Tera Technologies

FAX NO: 415-934 0418

FROM: Don Wadsworth

NO. OF PAGES INCLUDING COVER SHEET:

IF YOU HAVE ANY PROBLEMS WITH TRANSMISSION OF THIS FACSIMILE PLEASE CALL (415) 443-7967 FOR VOICE CONTACT OR (415) 443-0119 FOR FAX MACHINE.

MESSAGE: Item 20 of our license states we are authorized to calibrate the instruments you wish to rent and the requirements for calibration. Attachment 6 is the general instruction for calibration and the frequency of calibration (annual). All instruments are checked prior to rental.

Please call if you have any further questions.

Don Wadsworth

ATTACHMENT 6

7. Method, frequency, and standards used in calibrating instruments listed in Attachment 5.

All portable survey instruments and associated probes shall be calibrated in accordance with the manufacturer's specifications, ANSI N323-1978 "Radiation protection instrumentation test and calibration", or other applicable standards or regulations.

Count rate instruments shall be calibrated by utilizing an appropriate Pulser Generator as a "Standard Instrument" as defined in 5.3 of ANSI N323-1978 to determine the precision and accuracy of the scaler. Probes for the count rate instruments shall be checked for efficiency using NIST (formally NBS) traceable standards such as the Isotope Products or Eberline Alpha, Beta, and Gamma calibration source sets (see attachment 1). Certificates of calibration will be completed for each instrument and a sticker indicating the last and next calibration date will be affixed to the instrument calibrated. See Appendix F of Attachment 9.

Dose rate instruments shall be calibrated by Radiation Detection Company (RDC) in Sunnyvale CA.

All instruments shall be calibrated at least annually. Records shall be kept available for inspection as required.

RADIOACTIVE MATERIAL LICENSE

Pursuant to the California Administrative Code, Title 17, Chapter 5, Subchapter 4, Group 2, Licensing of Radioactive Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, use, possess, transfer, or dispose of radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders of the Department of Health Services now or hereafter in effect and to any conditions specified in this license.

1. *Licensee* New World Technology 2. *Address* P. O. Box 1167 Livermore, CA 94551-1167 *Attention:* Donald K. Wadsworth Health Physics Program Manager	3. *License No.* 5363-60 is hereby amended in its entirety. *Amendment No.* 1 4. *Expiration date* January 12, 1997 5. *Inspection agency* Radiologic Health Branch - Sacramento

6. Nuclide	7. Form	8. Possession Limit
A. Any nuclide with atomic numbers 3-88	A. Sealed sources (Isotope Products Laboratories or Eberline calibration standards)	A. 5 microcuries per nuclide, 100 microcuries total.
B. Any nuclide with atomic numbers 90, 92 94 and 95	B. Alpha emitter standard sets	B. 5 microcuries per nuclide, 100 microcuries total.
C. Any nuclide with atomic numbers 3-88, 90, 92, 94 and 95	C. Environmental samples and wipe samples	C. 1 microcurie total.

9. Authorized Use

A. and B. To be used for operational checks and calibration of instruments.

C. To be used for calibration, standardization and analytical measurements as a participant in U.S. EPA's Quality Assurance Program pursuant to the Safe Drinking Water Act and for analysis of the wipe samples obtained from the licensees customers.

---

10. Radioactive material shall be used only at the following location:

(a) 150 McLeod, Livermore, California

For the State Department of Health Services

Date July 27, 1990 by 3

Radiologic Health Section
744 P Street, Sacramento, CA 95814

License Number 5363-60

Amendment Number 1

RADIOACTIVE MATERIAL LICENSE

Supplementary Sheet

11. This license is subject to an annual fee for sources of radioactive material authorized to be possessed at any one time as specified in Item 8 of this license. The annual fee for this license is required by and computed in accordance with Sections 30230-30232 of the California Radiation Control Regulations and is also subject to an annual cost-of-living adjustment pursuant to Section 113 of the California Health and Safety Code.

12. Radioactive material shall be used by, or under the supervision of, the following individuals:

    (a) Donald K. Wadsworth, M.S.
    (b) Kenneth C. Lamson, M.S., C.H.P.

13. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in the documents listed below. The Department's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

    (a) The application with attachments dated May 24, 1989, signed by Donald K. Wadsworth.

    (b) The letter with attachments dated October 9, 1989, signed by Donald K. Wadsworth.

    (c) The letter dated January 12, 1990, signed by Donald K. Wadsworth.

    (d) The letter, with attachments, dated April 30, 1990, signed by Donald K. Wadsworth.

14. The radiation safety officer in this program shall be Donald K. Wadsworth.

15. Sealed sources possessed under this license shall be tested for leakage and/or contamination as required by Section 30275(c) of the California Radiation Control Regulations.

16. The following individuals are authorized to collect wipe test samples of sealed sources possessed under this license using leak test kits acceptable to the California Department of Health Services.

    (a) The radiation safety officer.

    (b) Qualified individuals designated by the radiation safety officer.

For the State Department of Health Services

Date July 27, 1990 by 3

RH 2551 (2/82)

Radiologic Health Branch
714 P Street, Sacramento, CA 95814

5363-60

RADIOACTIVE MATERIAL LICENSE

Supplementary Sheet

License Number 1

Amendment Number

17. The licensee is authorized to perform tests for leakage and/or contamination of sealed sources. The following tests may be performed for sources possessed under this license and as a customer service:

    (a) Collection of wipe test samples from sealed sources and devices containing sealed sources.

    (b) Analysis of materials collected by the licensee as stated in (a) above and material returned by customers from leak test kits listed in (b) above for amount of radioactivity. Reports to customers of analysis shall be in microcuries.

18. Records of leak test results shall be kept in units of microcuries and maintained for inspection. Records may be disposed of following Department inspection. Any leak test revealing the presence of 0.005 microcuries or more of removable radioactive material shall be reported to the Department of Health Services, Radiologic Health Branch, 744 P Street, P.O. Box 942732, Sacramento, CA 94234-7320, within five days of the test. This report shall include a description of the defective source or device, the results of the test, and the corrective action taken.

19. This license does not authorize distribution to persons licensed pursuant to Section 30195 (a) and (b) of the California Radiation Control Regulations or equivalent provisions of the NRC or Agreement States.

20. The licensee is authorized to calibrate count-rate radiation detection instruments (as a customer service/for his own use). Each calibration of a radiation detection instrument shall include not less than 2 points other than zero (separated by 50 percent of full scale) for each scale of the instrument certified by the licensee.

21. The licensee shall conduct a physical inventory every six months to account for all sources and/or devices received and possessed under the license. Records of the inventories shall be maintained for inspection, and may be disposed of following Department inspection.

For the State Department of Health Services

Date July 27, 1990

by

Radiologic Health Branch
714 P Street, Sacramento, CA 95814

RH 2551 (2/82)

NO.	QUAN.	PER.	DESCRIPTION

REFERENCE ONLY

CHG.	APP.	DATE	DESCRIPTION	DATE	BY	CH'K
F	[illegible]	7/14/86	Changes on Page 3 , 4 [illegible] calibration [illegible] DRR 5200	[illegible]	[illegible]	[illegible]
E	[illegible]	5/8/86 5033	Revised to [illegible] step [illegible], [illegible] calibration	5/[illegible]	[illegible]	[illegible]
D	[illegible]	1/28/86	DRR 4899 MOVED DET/INST CALIB. TEST TO 10429-A100	1/24/86	DS	[illegible]
C	[illegible]	8/16/85 4610 4554	Change values page 15 HP210/260 [illegible] [illegible] was >9.0+06, HP290 was >7.5E02 [illegible]-1 cal const was +03 added HP220R	8/16/85	[illegible]	[illegible]
B	[illegible]	4/[illegible]/85 4423	Change efficiency [illegible] HP190 to 35 % ± 4, was 45% ± 4.	[illegible]	[illegible]	[illegible]
A	[illegible]	2/[illegible]/85	[illegible] DRR4317	[illegible]	[illegible]	[illegible]

This document is for Eberline in-house usage only and is subject to modification at any time. The process described herein is valid only if performed by Eberline personnel at Eberline facilities.

EBERLINE INSTRUMENT CORPORATION
SANTA FE, NEW MEXICO

F 9/11/86

DR.	Ben Chavez	10/[illegible]
CH'K.	R L M	[illegible]
PROJ. ENG.	[illegible]	[illegible]
APP.	[illegible]	[illegible]

ESP-1

DIMENSIONAL TOLERANCES
UNLESS OTHERWISE SPECIFIED

FRAC.	DEC.	ANG.

SCALE

CHECKOUT PROCEDURE	MDL:	ESP-1	DWG NO.	10429-A374	SHEET 2	OF 4

A. FUNCTION

1) Preparation:

a) Board set has been tested per its Checkout Procedure.

b) EPROM with current version program is installed.

c) Install batteries

d) Connect MP-1 (or MP-2) to detector connector

TEST

1. Press "ON/OFF".

2. With MP-1 (MP-2) set at 20 Mv and 40 K cpm, readout shows 6.6(x)+02 cnt/s

Note: (x) = Don't care.

3. Press "RESET". Bargraph is 1/3 scale.

4. Press "MODE".
   Display = "SCALER MODE "
   "+ = YES/- = NO"

5. Press "-".
   Display = "ALM AT 1.00+06"
   "6.6(x)+02 cnt/sec"

6. Press "+".
   Display = "UNITS = (cnt/s or cnt/min)"
   "6.6(x)+02 cnt/sec or 4.00+04 cnt/min"

7. Press "RESET".
   Display = "BASE cnt"
   "+ = USE/- = NO"

8. PRESS "+", and/or "-" to select "cnt/min".
   Display = "CC = 1.00+00"
   "4.00+04 cnt/min"

9. Press "+".
   Display = "DT (SEC) 9.98-07"
   "4.00+04 cnt/min"

10. Press "+".
    Display = "HV = (X)"
    "4.00+04 cnt/min"

11. Press "-".
    Display = "DT (SEC) 9.98-07"
    "(x)"

12. Press "RESET" and "+". DT value should increase.

13. Press "RESET" and "-". DT value should decrease.

14. Set DT for 1.00-05.

15. Press "MODE", "MODE", "+". (Now in scaler MODE).
    Display = "UNITS = cnt"
    "+ = USE/- = NO"

16. Press "-".
    Display = "UNITS = EVENTS"
    "+ = USE/- = NO"

17. Press "+".
    Display = "UNITS = EVENTS"
    "ALM AT 1.00+06"

18. Press "+".
    Display = "UNITS = EVENTS"
    "CNT FOR 0:01:00"

19. Set "CNT FOR" TO 0:00:06 (6 sec) using "RESET" and "-".

20. Press "+".
    Display = "CNT FOR 0:00:06
    "RESET" TO START"

21. Press "RESET". Top line will display "TIME LEFT" (After 1 sec) and bottom line = EVENTS (After 2 sec). When count is complete:
    Display = "CNT FOR 0:00:06"
    "(3.97+03 to 4.01+03) EVENTS"

22. Press "MODE", "MODE",. UNIT IS IN COUNT RATE MODE.

NOTE: Instruments for inventory and no detector, perform "B.1" thru "B.2" only.

B. HV CALIBRATION

1. Verify HV and calibrate the HV display to agree.
   Calib. is performed with "RESET" and "+" or "-".

CHECKOUT PROCEDURE	MDL:	ESP-1	DWG NO.	10429-A374	SHEET	4 OF 4

2. Pulser cneck

   1) Set IS = 10 mV ("D" POT)
   2) Adj "CC" = 1.00
   3) Adj "DT" = 1.00-06
   4) Select units = cnt/min
   5) Connect the MP-1 or MP-2 and verify the input sensitivity.
   6) Apply a frequency of 20k cpm, Should be ±10 percent of input. Verify the speaker operates properly.

   7) Set the alarm at 8.00×10^5 cpm cause an alarm by inputing a frequency of 160 x 10 K cpm. Verify that the alarm sounds and the display remains on.

3. Reference 10429-A400 Checkout Procedure labled for the detector being used on the ESP to complete calibration and checkout.

NO.	QUAN.	PER.	DESCRIPTION

REFERENCE ONLY

CHG.	APP.	DATE	DESCRIPTION	DATE	BY	CH'K
H	[illegible]	10/15/84 4204	[illegible]	10/84	BC	[illegible]
G-1	ELB	3/31/82	SHT 2, Item 3.e was ... Step c.	3/30/82	L D	ELB
G	ELB	3/20/82	Added Cover sheet Retyped with various changes	3/16/82	L. D	J.V.

Q A I APP. REV. H 10/25/84 [illegible]

EBERLINE INSTRUMENT CORPORATION

SANTA FE, NEW MEXICO

DR.	
CH'K.	
PROJ. ENG.	
APP.	

MODEL AC-3

CHECKOUT PROCEDURE

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED

FRAC.	DEC.	ANG.
± 1/64	X.XX ± .015	[illegible]

SCALE

10429-A06 H

Sheet 1 of 2

ALSO USED ON | USE WITH

This document is for Eberline in-house usage only and is subject to modification at any time. The process described herein is valid only if performed by Eberline personnel at Eberline facilities.

CHECKOUT PROCEDURE	MDL: AC-3	DWG NO. 10429-A06	SHEET 2 OF 3

SET-UP AND CALIBRATION

1. Connect AC-3 to probe tester using CA-5-36 cable. Set the probe tester input sensitivity to 10 mV as measured with an MP-1.

2. Run a plateau curve using a 1-inch diameter ^{239}Pu source of 80k cpm to 500k cpm.

3. Determine acceptability of the plateau as follows: (See example below)

   a. Estimate the voltage at the center of the flatest portion of the plateau. Note Voltage.

   b. Calculate 15 percent of the voltage in step a. Note.

   c. Read the count rate at the voltage determined in step a. Note.

   d. Calculate count rates of step c. ± 10 percent. Note.

   e. From the plateau, determine the voltage difference between the two count rates calculated in step d. Note.

   f. The number obtained in step e. must equal or exceed the number obtained in step b.

Example:

Step a. 1000 V

Step b. 15 percent of 1000 V = 150 V

Step c. 400k cpm (count rate at 1000 V)

Step d. 400k + 10 percent = 440k cpm
400k - 10 percent = 360k cpm

Step e. 360k cpm is reached at 830 V.
440k cpm is reached at 1160 V.
1160 V - 830 V = 330 V

Step f. 330 V is greater than 150 V -- probe passes this test.

4. Pick voltage setting as high as possible on the plateau to have a background less than 30 true counts per minute.

5. At this voltage read and record the following on the plateau form:

   a. Background: Must be less than 30 true cpm.

CHECKOUT PROCEDURE	MDL: AC-3	DWG NO. 10429-A06	SHEET 3 OF 3

b. Efficiency: Use same source as above. Read meter or external scaler with source at front end. Figure as shown.

$$\frac{\text{Reading} \times 100}{\text{Scource cpm}} = \text{Efficiency}$$

Must be greater than 31 percent for AC-3-7, 18 percent for AC-3-8.

c. Uniformity: Use 1-inch diameter ^{239}Pu source. Read meter or external scaler with source; 1) at one end, 2) centered, 3) at other end. No individual reading shall differ by more than ± 12 percent from the average of the three readings.

6. Attach plateau and data sheet to the AC-3.

7. A final light leak check shall be performed with either a high-intensity lamp or direct sunlight. At some point in this test, the probe should be exposed to the light at the same time that a check source is placed against the face of the probe. (This insures that a light leak is not so big that the PM tube is saturated.)

APPENDIX D

Organic Vapor Analyzer Calibration Procedures

hnu systems inc. chemical instrumentation

Calibrating PI 101 in the Field

Equipment:

Flat head screwdriver
Phillips head screwdriver
Very small flat head screwdriver
Soldering Iron
Solder
Assortment of M resistors (1M to 22M)
Tank Calibration gas cylinder
Needle nose pliers
wire cutters
Small piece rubber tubing or hose to join gas cylinder to unit.

Procedures:

Case 1.

1. Take PI 101, unlatch and remove top covers. Remove probe from inside covers and attach probe to unit. (Join 12 Pin connector on probe with the 12 Pin connector on unit. Be sure to align open notch of probe with the key in the units connector then screw probe onto unit.)

2. Zero unit by turning unit to standby and using zero knob to zero the electronics and turn unit OFF.

3. Attach cylinder of cal. gas to the hole at the top of the probe. (May have to use some rubber tubing). And turn on cylinder of gas.

4. With gas cylinder attached and ON; turn PI 101 unit to the 0-200 setting. The unit should read approximately 50 ppm on the PI 101 meter. It it does, use the instrument, if not turn off unit and procede as follows:

   A. Remove accessory plug and then loosen screw from bottom of unit.

4. Cont'd.

   A. Cont'd
   The grab bezel in one hand and the case of the unit in the other and pull until case is removed.

   B. Then set unit on bench and make sure probe and cal. gas are attached.

5. Locate power supply board with all its electronic components. On that board locate HNU logo. Right next to that is the serial number of your power supply board. About one inch below the serial number you will find a tiny hole in which you will see what appears to be a small screw head. That is the fine adjustment for the calibration of your unit. (This fine adjustment pot will be fused in next step.)

6. Again make sure probe and cal. gas are attached to unit and try a second calibration (Keep gas ON). Now using the very small flat head screwdriver try turning the fine adjustment pot on the power supply board until the meter reads the desired level of calibration.

7. If this fails to give the desired calibration, find the extreme high and extreme low readings and then set fine adjustment pot in the middle of those high and low readings and continue on with gross calibration.

Gross Calibration

Case 2:

1. See the fine calibration so that fine calibration pot is set to read in the middle of its range.

2. Note the readout at the middle setting (Write it down).

3. Turn the unit OFF COMPLETELY.

4. Look atprobe and note the vent screw at the base of the probe (right before the handle). Remove the vent screw and pull on the top of the probe so that the housing pulls loose from the shell.

5. Look at amp board with electronic components on it. Then look at the back side of amp board, the side with the solder connections and 2 resistors. Make note of the top or outer most resistor, the one with a blue or green band in the middle. That is the gross calibration resistor. Figure out the value of that resistor and plug that value in to the following formula inorder to derive the new the new calibration resistor needed to bring the unit into calibration. See Formula.

Formula

$$\frac{\text{Expected Reading (ppm)}}{\text{Actual Mid Point Reading (ppm)}} \times \text{Value old calibration Resistor} = \text{New Resist}$$

The reading you expected to get divided by the reading you actually got at the mid point setting on the fine adjustment then all that times the value of the old resistor will yield the value of the new resistor.

1. Use the resistor value closest to that. Find the new resistor in your stock.
2. Loosen screw that holds amp board in place and remove board from lamp housing.
3. Take soldering iron and remove old resistor.(Note where it was.)
4. Trim leads of new resistor so that they are just a shade longer than old resistor.
5. Holding resistor by needle nose pliers, resolder new resistor in place.
6. Let cool for a few minutes, then with small screw reattach amp board to lamp housing.
7. Put lamp housing back in probe shell and replace vent screw.
8. Attempt to recalibrate unit. Since you just changed the gross calibration resistor, some final fine adjustment on the board in the power supply may be necessary.
9. If nccessary, see procedures for calibration of fine adjustment pot on power supply.